INSTRUCTIONS WITH PARTS LIST

FOR

WESTON®

MODEL 1261

DIGITAL PANEL METER

U.S. Patent 3,051,939
and Patents Pending

Copyright 1970

WESTON INSTRUMENTS DIVISION
WESTON INSTRUMENTS, INC.
614 FRELINGHUYSEN AVENUE, NEWARK, N. J. 07114
a Schlumberger company

F-3653 R2 10/70

Printed in U.S.A.

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GENERAL SPECIFICATIONS *

Minimum Range	000 to 999 Millivolts D. C.
Over Range	50% (except 1000 Volt Range)
Under Range	10% (1000's complement)
Rated Accuracy	±0.1% of Full Scale ±1 Digit
Input Resistance	50 Megohm
Common Mode Rejection Ratio	80 DB with 1000 Ohm Unbalance at 60 Hz
Normal Mode Rejection Ratio	35 DB at 60 Hz
Speed	0.2 Seconds Per Reading
Response Time	2 Seconds
Max Voltage Overload	10 Volts D. C.
Stability (Short Term)	±0.1% Full Scale
Power	117 Volt Nominal, 110 to 125 Volts Rated. 105 to 130 extreme 50 Hz to 60 Hz, typically 6 1/4 Watts.
Operating Temperature	(12°C to 40°C)
Extreme Operating Range	5°C to 45°C
Storage Temperature	-40°C to 70°C
Out-range Indication	Separate indicators operate when unit is under-range (below zero) or over-range.
Breakdown Voltage	(Shield-to-either Line or Low Side of Input) 500 volts rms
Weight	Less than 1 lb. (450 grams)

Refer to Table 1 for a tabulation of specifications pertaining to specific instruments.

* Specifications subject to change without notice.

TABLE 1.
TABLE OF SPECIFICATIONS *

RANGE (DC)	SENSITIVITY	INPUT IMPEDANCE	FULL SCALE PRESENTATION	NAME PLATE DATA	MAXIMUM VOLTAGE OVERLOAD	EFFECTIVE COMMON MODE REJECTION AT 60 Hz
1000 Volts	1 v	5 Meg.	999	Kilovolts DC	1100	Minus Terminal on GND
100 Volts	100 mv	5 Meg.	99.9	Volts DC	1000	74 db
10 Volts	10 mv	5 M	9.99	Volts DC	200	80 db
1 Volts	1 mv	500 M	.999	Volts DC	10	80 db
100 Millivolts	100 μv	50 M	99.9	Millivolts DC	10	80 db
100 Milliamperes	100 μa	1 Ω	99.9	Milliamperes DC	-	-
10 Milliamperes	10 μ a	10 Ω	9.99	Milliamperes DC	-	-
1 Milliampere	1 μa	100 Ω	.999	Milliamperes DC	-	-
100 Microamperes	100 na	1 K	99.9	Microamperes DC	-	-
10 Microamperes	10 na	10 K	9.99	Microamperes DC	-	-

*Specifications subject to change without notice

GENERAL

The Weston Model 1261 Digital Panel Meter is a miniature single range, mono-polar instrument designed to indicate input DC voltage or current in one of 10 possible ranges. The display is digital rather than the previous standard analog moving pointer method. Full scale is 999 digits. All design features are in keeping with panel meter usage but the digital concept provides linearity, high accuracy, stability and speed of reading without consideration of such factors as parallax, reader interpretation or tracking inherent in analog devices.

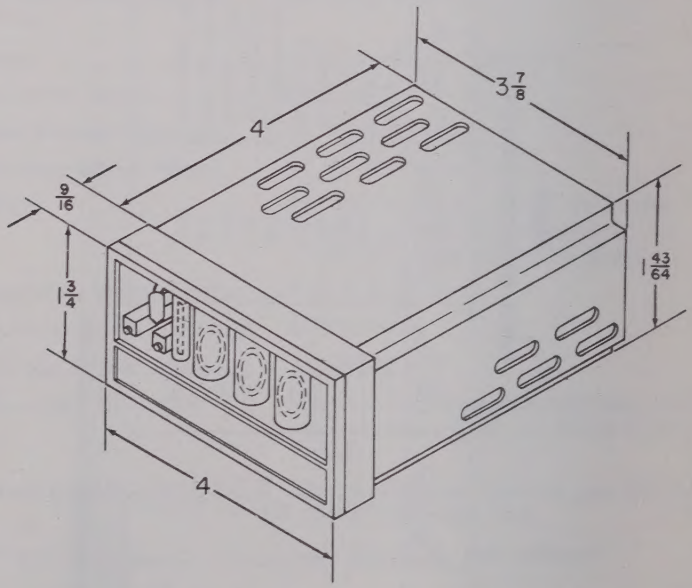


Figure 1. Outline Dimensional Drawing

The meter is provided with a 50% over-range capability on all ranges except the 1000 Volt DC full scale range.

Separate automatic out-range lamps are provided to indicate that the meter is operating below zero (negative input) or over-range. The over-range indicator resembles a "one" and blinks. An option is available to provide a steady, 1000 indication. Inputs greater than 1500 eventually limit and it is possible for a display of 1---, with the under-range lamp lit, to appear with very large positive over-range voltages. With inputs that are more negative than zero, the under-range indicator is always lit. However, if the negative input is less than approximately 10% of full scale, the complement value is displayed. Still more negative inputs produce a flickering display and very large negative inputs are displayed as 000 with the under-range indicator lit.

Remote operation, three decades of 1 - 2 - 4 - 8 BCD (Binary Coded Decimal), the numeric 1000 and U/R (under range) can be provided as additional features. The remote output is used to stop conversion and maintain the last reading displayed on the readout tubes and BCD outputs. The BCD decades are used to provide outputs to drive external equipment such as printers.

The case front has a circularly polarized filter window to eliminate glare. Zero and slope adjustment facilities are provided. The adjustments are made accessible by removing the front bezel. Adjustment may be made over a range of approximately ±10 counts.

The meter is manufactured by Weston Instruments Division, Weston Instruments Inc., Newark, New Jersey. All inquiries pertaining to operation or repair of this instrument should be directed to Weston-Newark. Refer to Figure 1, Outline Dimensional Drawing, for a pictorial view of the meter and overall dimensions.

INSTALLATION AND OPERATING INSTRUCTIONS

PANEL MOUNTING

1. Unpack the meter and perform a visual inspection to assure that no damage has occurred during shipment or handling.

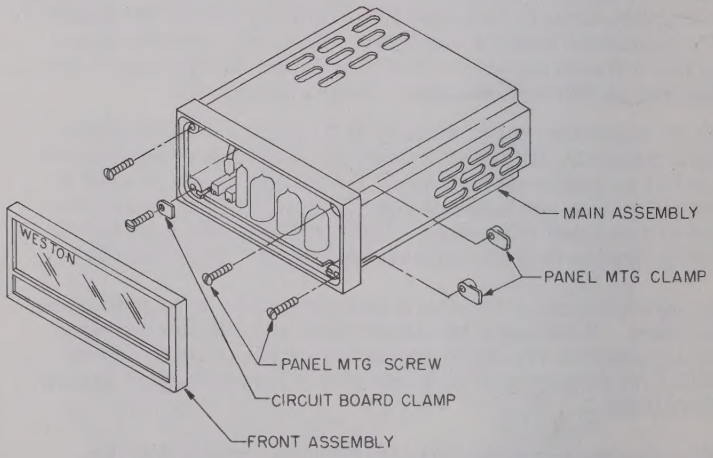


Figure 2. Meter Mounting Drawing

2. Remove front assembly. Rotate the four mounting screws (located in the four inner corners) 3 or 4 times counter clockwise to position the mounting cams correctly. Mount the main assembly (see Figure 2) on a panel 1/16 to 1/8 inch thick. The panel shall be prepared in accordance with the panel cut out dimensions as shown in Figure 3. Rotate the four mounting screws clockwise to position the mounting cams in the lock, position and secure the instrument to the panel.

3. The front assembly can be secured into position at this time. The assembly will have to be removed to adjust and calibrate the meter.

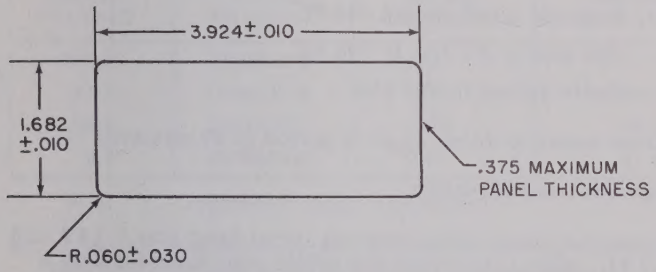


Figure 3. Panel Cut-Out Dimensions

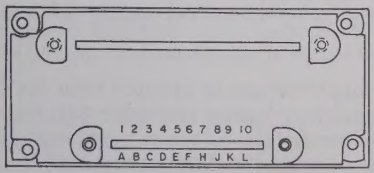


Figure 4. Rear View Pin Designations

ELECTRICAL ADJUSTMENT AND OPERATION

1. After the meter has been panel mounted, connect a 117 Volt single phase power line as follows: (See Figure 4).

   a. One side of AC line to Pin #L

   b. One side of AC line to Pin #K

   c. Earth ground to Pin #10

2. Allow meter to warm up for a period of 30 minutes.

3. Remove front assembly.

4. Connect a jumper wire between signal input pins (-) #A and (+) #1. Rotate the(right)zero adjust potentiometer with a screw driver until the meter indicates 000 ±1 digit.

5. Connect a standard source having a value corresponding to full scale to the signal input pins. Rotate the (left) slope adjust potentiometer with a screw driver until meter indicates 1000.

6. Repeat steps 4 and 5 as necessary until proper adjustment is achieved. The instrument is now ready for operation.

7. Full scale digital presentation of meter is as tabulated in Table 1.

8. If the applied input voltage is greater than the full scale value, a blinking over-range indicator will be energized to indicate this condition. When a reversed polarity voltage is applied to the meter it indicates the 1000's complement, (display-1000), and an under-range indicator is lit.

9. The following table depicts basic conditions which may exist during the course of normal meter operation. The example given is for a 100 millivolt range meter.

APPLIED SIGNAL VOLTAGE	SIGNAL INPUT POLARITY	UNDER RANGE INDICATOR	DISPLAY INDICATION
200.0	CORRECT	ON	: ----
150.0	CORRECT	OFF	: 50.0
99.9	CORRECT	OFF	99.9
9.0	REVERSED	ON	91.0

Note: : = Indicates blinking numeral one.

10. To stop the conversion and maintain the last reading, the Model 1261 can be equipped with a contact on a rear connector pin, (connects to remote (3) on "mask" circuit board). By closing a switch between this pin and ground, the last conversion may be held for as long as desired. By opening the switch, normal operation is resumed. Synchronization of a number of Model 1261 units can also be obtained by this means.

11. Three decades of 1 - 2 - 4 - 8 BCD and the numeric 100, as well as out-range, can be provided at the rear connector of the instrument to drive external devices. The rise and fall time of the output is compatible with industrial milliwatt RTL (Resistor-Transistor-Logic) micrologic or its equal. Logic levels are: Logical 0 equal to or greater than +1 Volt DC, and Logical 1 equal to or less than +0.4 Volt DC. For applications where other logic levels must be met, interface criteria should be coordinated with the factory.

12. The print command, P.C. on the circuit board, is used to provide a 1.0 Volt output signal when conversion from analog to digital is complete. The purpose of P.C. is to key the external devices (see Step 1) for information acceptance.

13. A maximum of 14 connector pins are available for options 10 through 12 above.

14. A 360 Ω resistor should be used on all the BCD output points (except the 1000 output which requires 680 Ω and the print command output which requires 1500 Ω) to buffer stray capacitance. A 200 pfd capacitive load together with a milliwatt RTL (unit load) load is permissible on the outputs via the buffer resistors.

THEORY OF OPERATION

GENERAL

This section, in conjunction with the Block Diagram Figure 5 and Waveforms Figure 6, contains a discussion of the theory of operation of the Model 1261 Digital Panel Meter.

Basically, the Model 1261 is a single range, high input impedance, digital panel meter that is capable of being constructed as a voltmeter or current meter with the addition of an appropriate attenuator or shunt. Standard self-contained current or voltage ranges are available from Weston as shown in Table I.

The instrument utilizes a dual slope integration technique. Dual slope converts the input signal into a ratio of two time intervals, both proportional to clock period making conversion accuracy independent of clock accuracy. Accuracy of conversion is dependent upon the stability of the internal reference circuit.

$$\frac{E_{in}}{R_1} \times \frac{800}{C_1 \cdot f_{clock}} = \frac{K I_{REF}}{1} \times \frac{N}{C_1 f_{clock}}$$

$$N = \frac{(E_{in})(800)}{(I_{REF})(R_1)K}$$

Conversions are synchronized with the power line frequency and performed within 8 milliseconds to achieve a flicker free display without the use of display storage registers.

A certain amount of normal mode rejection results from synchronizing the conversions, but an RC filter is also used at the input for most of the A - C rejection.

OPERATION (See Block Diagram and Waveforms, figures 5 and 6)

The 5 Hz trigger circuit is synchronized to the power line to initiate a conversion at an A-C line voltage zero crossing. Since the readout display is excited with a half-wave rectified voltage, a non-blink pseudo-storage display results (decade counter state changes occur within the 8 1/3 ms. interval when the display is not energized to produce an output).

The integrator is non-inverting and has a high impedance input. Dual slope conversion is employed. The analog switch (a transistor operated in the inverted mode) connects either the current source or the input E_{in}/R_1 to the integrator input. During the positive ramp period ("A" in figure 6), the analog switch is closed shunting I_{REF} to ground and allowing $\frac{E_{in}}{R_1}$ to charge C_1. Period "A" is 800 counts plus the time required for the integrator output to increase from the clamped condition to the comparator threshold. During the negative ramp period "B", I_{REF} discharges C_1.

Quiescently the integrator output is $\left[E_{in} - (\text{a diode drop})\right]$. This results in the comparator output inhibiting the 600 KHz clock. The reset pulse resets the control flip-flop which closes the analog switch. This starts the positive ramp period, "A". The clock remains inhibited until the comparator threshold is reached. At this instant the output of the comparator changes state and the flow of clock pulses into the counter is enabled. Also, timing of the input charging process starts. When 800 clock pulses have entered the counter, the input charging ends and the negative going ramp "B" begins. As the intergrator output crosses the comparator's threshold, the clock is inhibited and counting stops. The integrator output settles into the quiescent state and the counters hold the output information until a new conversion cycle begins.

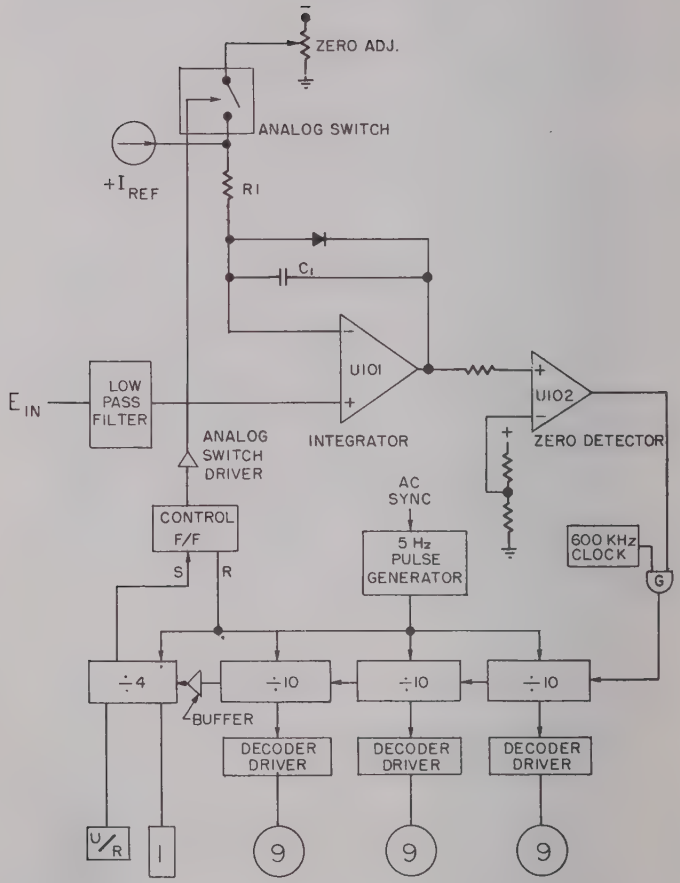


Figure 5. Block Diagram

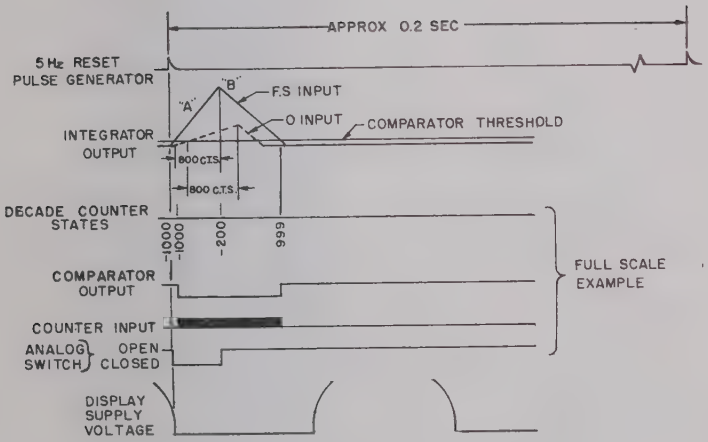


Figure 6. Waveforms

TABLE 2. RANGE COMPONENTS

PART NO.	RANGE	R105 PAD A-B	R106 PAD B-C	R109 PAD D-E	R112 PAD F-F	R118 PAD H-H
270408-901	10UA	-	-	266627 10K		
270408-902	100UA	-	-	266628 1K		
270408-903	1MA	-	-	264775 100Ω	270156 1.5K	270166 5 Ω
270408-904	10MA	-	-	264773 10 Ω		
270408-905	100MA	-	-	264776 1 Ω		
270408-906	100MV	-	-	-		
270408-907	1V	-	-	-	266593 15K	269886 49.9 Ω
270408-908	10V	270197 2.49M	270197 2.49M	269884 49.9K	270156 1.5K	270166 5 Ω
270408-909	100V			269911 4.99K		
270408-910	1000V			270194 499 Ω		

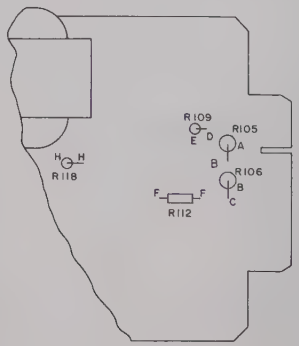
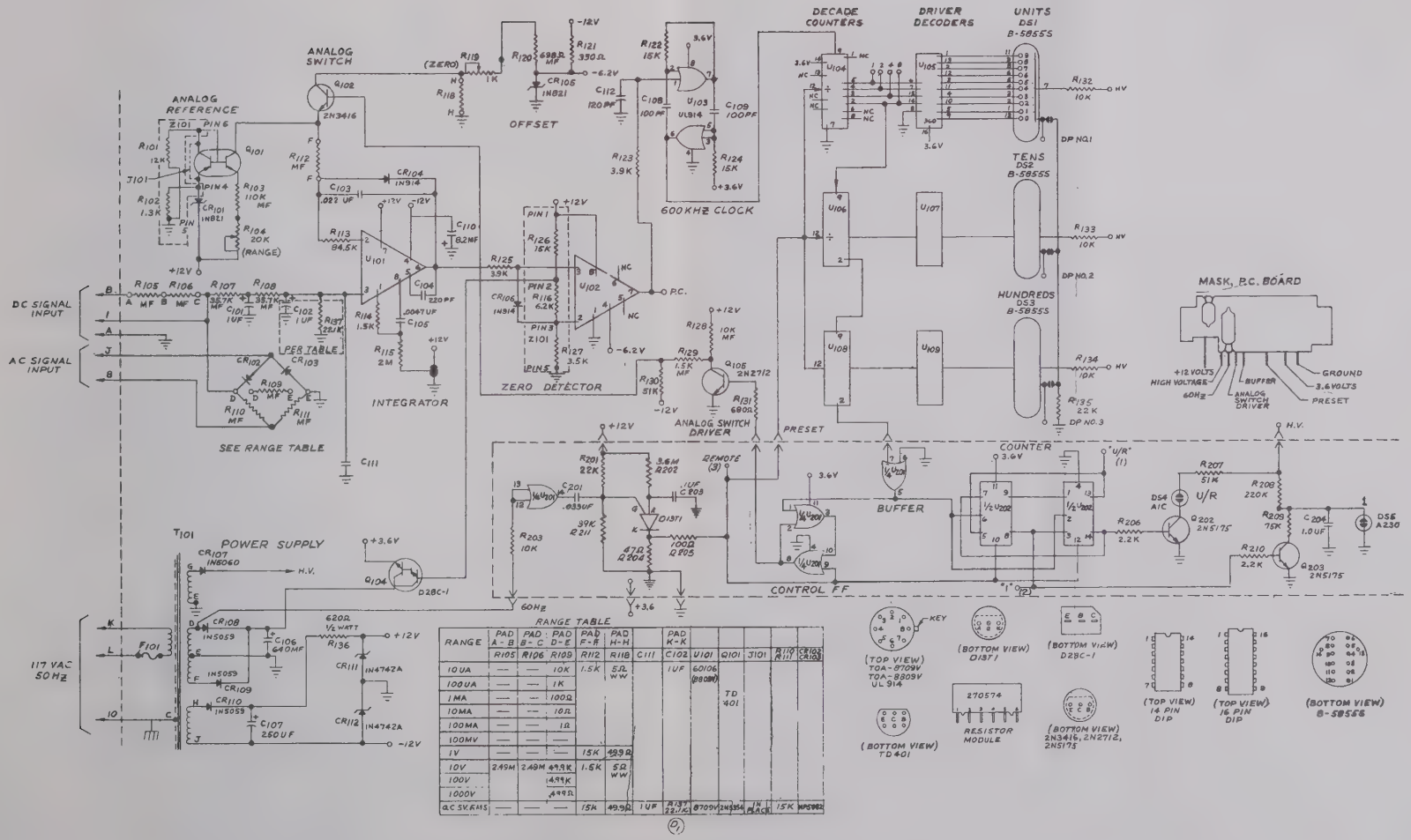


Figure 7. Range Components
See Table 2



RANGE TABLE

RANGE	PAD A-B R105	PAD B-C R106	PAD D-E R109	PAD F-H R112	PAD H-H R118	C111	PAD K-K C102	U101	Q101	3101	R110 R111	CR102 CR103
10 UA	—	—	10K	1.5K	5Ω WW		1UF	60106 (B809V)				
100 UA	—	—	1K						TD 401			
1 MA	—	—	100Ω									
10 MA	—	—	10Ω									
100 MA	—	—	1Ω									
100 MV	—	—	—									
1V	—	—	—	15K	49.9Ω							
10V	2.49M	2.49M	499K	1.5K	5Ω WW							
100V			4.99K									
1000V			499Ω									
AC 5V.RMS	—	—	—	15K	49.9Ω	1UF	R137 22.1K	8709V	2N5354	1N 4742A	15K	MPS9621

Figure 8. Schematic Wiring Diagram

WESTON EQUIPMENT WARRANTY

Weston warrants equipment of its manufacture against defective materials or workmanship for a period of one year from date of shipment.

The liability of Seller under this warranty is limited, at Seller's option, solely to repair, replacement with equivalent Weston equipment, at an appropriate credit adjustment not to exceed the original equipment sales price, of equipment returned to the Seller provided that (a) Seller is promptly notified in writing by Buyer upon discovery of defects, (b) Upon receipt of written authorization from Seller the defective equipment is returned as directed, transportation charges prepaid by Buyer, and, (c) Seller's examination of such equipment discloses to his satisfaction that defects were not caused by negligence, misuse, improper installation, accident, or unauthorized repair or alteration by the Buyer. Any modification such as changing range resistors may void this warranty.

This warranty does not include mechanical parts failing from normal usage nor does it cover limited life electrical components which deteriorate with age such as tubes, lamps, etc.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose to the original purchaser or to any other person. Seller shall not be liable for consequential damages of any kind.

The aforementioned provisions do not extend the original warranty period of any article which has been either repaired or replaced by Seller.

REPLACEMENT PARTS LIST
MODEL 1261

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
	BOARD ASSEMBLY	
C101, C102	CAPACITOR, 1 μf	270163-001
C103	CAPACITOR, .022 μf	ND61031-001
C104	CAPACITOR, 220 pf	264091-001
C105	CAPACITOR, .0047 μf	269898-001
C106	CAPACITOR, 640 mfd 10v	270167-001
C107	CAPACITOR, 250 μf	266349-001
C108, C109	CAPACITOR, 100 pf	266325-001
C110	CAPACITOR, 8.2 mf	269952-001
C112	CAPACITOR, 120 pf	264090-001
CR101, CR105	DIODE, Zener 1N821	263207-001
CR104, CR106	DIODE, 1N914	ND61025-001
CR107	DIODE, 1N5060	266591-001
CR108, CR109, CR110	DIODE, 1N5059	266611-001
CR111, CR112	DIODE, 1N4742A	264601-001
DS1, DS2, DS3	TUBE, Readout	266601-001
F101	FUSE, 1/4 Amp	268798-001
Q101	TRANSISTOR, TD401	269904-001
Q102	TRANSISTOR, 2N3416	263642-001
Q104	TRANSISTOR, D28C-1	268797-001
Q105	TRANSISTOR, 2N2712	ND39917-001
R103	RESISTOR, 110K RN55D	270173-001
R104	POTENTIOMETER 20K	270161-001
R105, R106	RESISTOR, See Range Table 2, Page 12	Select
R107, R108	RESISTOR, 35.7K RN55D	270158-001
R109	RESISTOR, See Range Table 2, Page 12	Select
R112	RESISTOR, See Range Table 2, Page 12	Select
R113	RESISTOR, 84.5K	270157-001
R114	RESISTOR, 1.5K Carbon	264677-001
R115	RESISTOR, 2M	269932-001

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
R118	RESISTOR, See Range Table 2, Page 12	Select
R119	POTENTIOMETER, 1K (Zero)	270162-001
R120	RESISTOR, 698 Ωmf	270172-001
R121	RESISTOR, 330 Ω	272233-001
R122, R124	RESISTOR, 15K ±5% 1/4w	263655-001
R123, R125	RESISTOR, 3.9K	264671-001
R128	RESISTOR, 10K RN55D	269887-001
R129	RESISTOR, 1.5K mf	270156-001
R130	RESISTOR, 51K	268785-001
R131	RESISTOR, 680 Ω	266321-001
R132, R133 R134	RESISTOR, 10K ±5% 1/4w	264673-001
R135	RESISTOR, 22K	264674-001
R136	RESISTOR, 620 Ω 1/2w	279184-001
T101	TRANSFORMER	270468-901
U101	MICROCIRCUIT, 60106	266655-001
U102	MICROCIRCUIT, 1710	269903-001
U103	MICROCIRCUIT, UL914	268793-001
U104, U106 U108	MICROCIRCUIT, 9958	266596-001
U105, U107 U109	MICROCIRCUIT, 9960	266397-001
Z101	RESISTOR MODULE	270574-001
	BOARD ASSEMBLY, MASK	
C201	CAPACITOR, .033 μf	272241-001
C203	CAPACITOR, .1 μf	269900-001
C204	CAPACITOR, 1.0 μf 200v	264752-001
DS4	BULB, A1C	ND337710-001
DS5	BULB, A230	269870-001
Q201	P.U.T., D13T1	272205-001
Q202, Q203	TRANSISTOR, 2N5175	266585-001
R201	RESISTOR, 22K	264674-001
R202	RESISTOR, 3.6M	272240-001
R203	RESISTOR, 10K Ω	264673-001
R204	RESISTOR, 47 Ω	ND61218-001
R205	RESISTOR, 100 Ω	ND37340-001

REFERENCE SYMBOL	DESCRIPTION	WESTON PART NO.
R206, R210	RESISTOR, 2.2K Ω	265866-001
R207	RESISTOR, 51K Ω 1/4w	268785-001
R208	RESISTOR, 220K	264672-001
R209	RESISTOR, 75K Ω 1/4w 5%	270171-001
R211	RESISTOR, 39K	263656-001
U201	MICROCIRCUIT, MC724P	264608-001
U202	MICROCIRCUIT, MC890P	268792-001

Note: Board Assembly Part No. 270411-902 Non Blink, 1500 Display uses same list of parts as Part No. 270411-901 except as follows:

C204	REMOVE	
DS5	BULB, A261	266537-001
R208	RESISTOR, 51K	268785-001
R209	REPLACE WITH JUMPER	

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